Building and Executing Rover Plans with Contingent Tasks, Phase I

Completed Technology Project (2011 - 2012)

Project Introduction

During recent robotic field tests, NASA investigated the use of intelligent planetary rovers to improve the productivity of human explorers on planetary surfaces. For these field tests, a remote Science Team built rover plans to collect data that supplements astronaut EVA and a remote Flight Team supervised the execution of these plans. This model of operation requires the Science Team to generate and revise all plans, often taking a partially executed plan and quickly updating it in response to issues that may have nothing to do with science. As a result the Science Team pre-builds alternative plans, many of which are not used. In future exploration operations, astronauts orbiting a planet will supervise rovers operating on the surface below without benefit of real-time support from Earth because of time delay. In such cases it becomes important to provide a more flexible planning approach that permits the Science Team to distinguish essential tasks from tasks to be performed as time and resource permit, or in response to discovery (contingent tasks). TRACLabs and Carnegie Mellon University propose to build science alternatives into a single rover plan as contingent tasks, potentially reducing the time spent building plans and providing the Flight Team with more flexibility when executing plans. We will identify use cases describing how the Science Team will build plans with contingent tasks and how the Flight Team will execute these plans. We will design software for use by the Science Team to build plans with contingent tasks. We will design rover software for executing such plans and software for the Flight Team to supervise this execution. We will evaluate this design for use in K10 rover operations.

Primary U.S. Work Locations and Key Partners

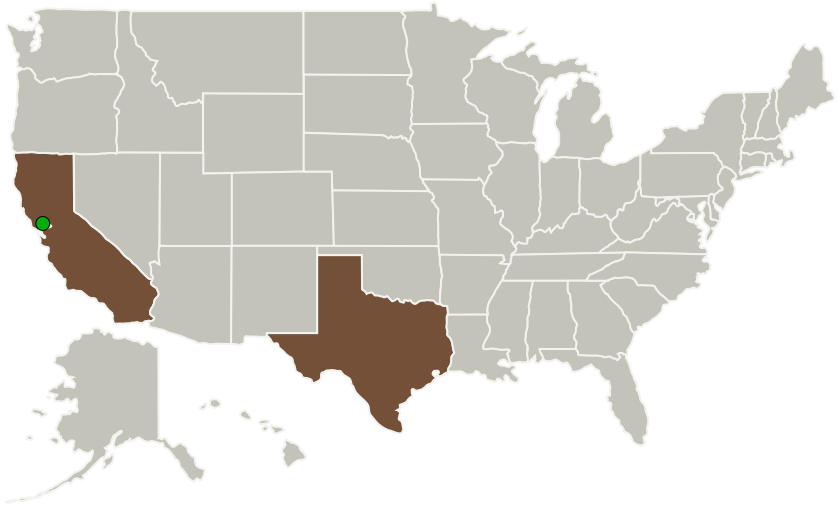

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Table of Contents

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Organizations Performing Work	Role	Type	Location
TRACLabs, Inc.	Lead Organization	Industry	Webster, Texas
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
Carnegie Mellon University - Silicon Valley	Supporting Organization	Academia	Moffett Field, California

Primary U.S. Work Locations	
California	Texas

Project Transitions

February 2011: Project Start

February 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138024)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TRACLabs, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

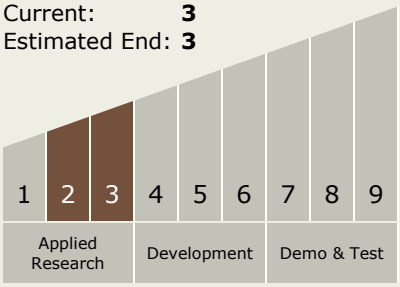
Carlos Torrez

Principal Investigator:

Debra L Schreckenghost

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.2 Reasoning and Acting
    - TX10.2.2 Activity and Resource Planning and Scheduling

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System